Landscape Architecture Program (LAP) Research Program Strategic Plan and Gap Analysis

January 2007

Purpose: The strategic research plan is a tool that articulates the role of research and its value in the LAP. It is a dynamic document that can be updated and changed as research needs evolve. By highlighting research priorities and identifying research gaps, the plan promotes an efficient and effective research process.

Caltrans
Mission: Caltrans improves mobility across California

LAP Research Program
Purpose: Advance landscape architectural practice and knowledge by researching and implementing state-of-the-art technologies and methodologies that balance mobility, safety and maintainability with economic needs, adjacent land use and aesthetic, environmental, scenic and community values.

Roadside Management

Goal: Develop standards and guidelines that improve the cost, efficiency and safety of ecologically-based sustainable roadside management practices

- **Erosion Control & Storm Water Pollution Prevention**
  Goal: Protect roadsides and improve storm water quality
- **Landscape Maintenance**
  Goal: Protect California's infrastructure investment and maximize maintenance efficiencies
- **Weed and Pest Control**
  Goal: Develop integrated best practices to prevent and control invasive and noxious species
- **Soils**
  Goal: Protect and improve soil resources

Design

Goal: Promote excellence in multi-modal transportation design that improves safety, mobility, economics and maintenance

- **Context Sensitive Solutions**
  Goal: Protect and enhance the environment and quality of life through a collaborative approach involving all stakeholders.
- **Aesthetic Values**
  Goal: Protect and improve aesthetic values visible from and to transportation facilities
- **Safety**
  Goal: Improve traveler and worker safety through design

Landscape

Goal: Promote environmental stewardship of the natural and constructed roadside landscape

- **Highway Planting**
  Goal: Improve planting and revegetation success
- **Irrigation**
  Goal: Conserve water and reduce irrigation life-cycle costs
- **Landscape Construction**
  Goal: Improve landscape construction methods

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Roadside Management

Completed and Ongoing
LAP Research Projects

Erosion Control and Storm Water Pollution Prevention

Goal: Protect roadsides and improve storm water quality

Objectives

1. Control roadside erosion and slope failures
2. Reduce discharge of pollutants to storm drainage systems
3. Comply with permit requirements
4. Improve soil structure
5. Integrate context sensitive storm water treatment facilities
6. Reduce and treat storm water runoff

Objective	Research Project
1, 2, 3, 4, 6	Compost for E.C. and Storm Water Treatment, 2009
1, 2, 3	Roadside Erosion Control Management Study, RECM, 2008
1, 2, 3	Eval. Of E.C. Test Trials, Lake Tahoe, 2008
1, 2, 3, 4	Soils Resource Evaluation, II, 2008
1, 2, 3, 4	Using Native Grass Sod for Biostrips & Bioswales, 2007
1, 2, 3, 4	Scoping and Siting of Ornamental Biostrips and Bioswales for Storm Water Treatment, 2007
1, 2, 3, 4	Use of Native Plants and Mycorrhizal Fungi for Slope Stabilization, 2007
1, 2, 3, 4, 5, 6	District 3 E.C. Demonstration Project Scoping and Siting, 2007
1, 2, 3	Seed Specification and Plant Calculator Tool, 2007
1, 2, 3, 4	Highway 46 Demonstration Project, 2007
1, 2	Arid Region Non-Veg Permanent E.C., 2006
1, 2, 3, 4	Soils Resource Evaluation, I, 2005
1, 2, 3, 4	Performance of E.C. Treatments on Reapplied Topsoil, 2005
1, 2, 3	Vegetation Establishment & Maintenance Study, VEMS, 2005
1, 2, 3, 4	The Use of Mycorrhizal Fungi in E.C. Applications, 2004
1, 2, 3, 4	Effective Planting Techniques to Minimize Erosion, 2004
1, 2, 3	Hydraulic Application Study, 2002
1, 2, 3	Veg Establishment for E.C. under Simulated Rainfall, 2002
1, 2, 3, 4	Rainfall Sim: Evaluating Hydroseeding & Plug Planting for E.C. & Improved Water Quality, 2002
1, 2, 3	District 5 Advisory Guide to Plant Species Selection of E.C., 2001
1, 2, 3	Final Performance Analysis Through the 1998 Evaluation Cycle Slope Protection Products, 1999
	Additional research needed to meet all objectives, especially #5 & #6

Landscape Maintenance

Goal: Protect California's infrastructure investment and maximize maintenance efficiencies

Objectives

1. Enhance revegetation and sustain highway planting
2. Reduce cost and frequency of maintenance activities
3. Improve worker safety
4. Minimize road closures
5. Preserve habitat
6. Reduce roadside trash
7. Graffiti abatement

Objective	Research Project
1, 2	Veg. Establishment and Maintenance Study, VEMS, 2005
	Additional research is needed to meet all objectives. Potential research topics previously identified by Landscape Architecture/Erosion Control Technical Advisory Panel (LA/EC TAP) & LAP include: Effective litter pick-up Development of trash fence Enforcement of current laws Effective public education Best practices of mowing Effective load containment

Soils

Goal: Protect and improve soil resources

Objectives

1. Improve soil quality to promote revegetation
2. Establish desirable vegetation in the R/W
3. Improve soil evaluation practices

Objective	Research Project
1, 2, 3	Use of Organic Amendments for Revegetation of Disturbed Sites with Adverse Soil Conditions, 2005
1, 2	The Use of Mycorrhizal Fungi in Erosion Control Applications, 2004
1, 2	The Effects of Topsoil Reapplication on Vegetation Reestablishment, 1994
	Additional research is needed to meet all objectives, especially #3

Weed and Pest Control

Goal: Develop integrated best practices to prevent and control invasive and noxious species

Objectives

1. Identify and control noxious weeds
2. Reduce herbicide use
3. Reduce recurrent maintenance activities
4. Preserve habitat
5. Develop stakeholder partnerships
6. Control unwanted vegetation
7. Minimize fire hazards
8. Preserve roadside native plants

Objective	Research Project
1, 2, 3, 4, 5, 8	Enhanced Biological Control of Yellow Starthistle, 2006
1, 2, 3, 4, 6, 8	Veg. Conversion to Desirable Species, II, 2006
1, 2, 3, 4, 6, 7	Weed Mat Trial, 2006
1, 2, 3, 4, 6, 7	Exploring Alt. Methods for Veg Control, 2003
1, 2, 3, 4	Biological Control of Cape Ivy, 2002
1, 2, 3, 4 ,5	International Broom Initiative, 2002
1, 2, 3, 4	Biological Control of Weeds, 2002
1, 2, 3, 4	Biological Control of Yellow Starthistle, Tri-Annual Report, 1998
1, 2, 3, 4, 5	Integrated Pest Management Plan for Control of Eucalyptus Longhorned Borer, 1994
	Additional research is needed to meet all objectives. Potential research topics previously identified by LA/EC TAP & LAP include: Economic impacts of weeds on neighboring ag. communities Environmentally friendly sprays Best practices of weed control

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Design and Planning

Completed and Ongoing
LAP Research Projects

Context Sensitive Solutions

Goal: Protect and enhance the environment and quality of life through a collaborative approach involving all stakeholders.

Objectives

1. Develop non-motorized transportation expertise
2. Improve connectivity of bike/ped infrastructure
3. Comply with ADA requirements and DIB 82-03
4. Facilitate relationship building with internal and external stakeholders
5. Prevent project delays, re-design and cost over-runs
6. Quantify economic benefits to communities
7. Develop design flexibility guidance
8. Implement corridor master plans
9. Quantify economic value of pollution removal services provided by landscaping

Objective	Research Project
1, 2, 4	Effects of Transportation Corridor Features on Driver and Pedestrian Behavior, 2009
	Additional research is needed to meet all objectives

Aesthetics

Goal: Protect and improve aesthetic values visible from and to transportation facilities

Objectives

1. Improve appearance and safety of roadside appurtenances
2. Protect scenic quality of transportation corridors
3. Quantify the value of aesthetics
4. Graffiti abatement

Objective	Research Project
1, 2	Aesthetic/Low Maintenance Guardrail System, 2009
1, 2	Low Profile Barrier, 2007
1, 2	Weathering Steel Guardrail, 2007
1, 2	California Highway Barrier Aesthetics Report, 2002
	Additional research is needed to meet all objectives, especially #3 & #4

Safety

Goal: Improve traveler and worker safety through design

Objectives

1. Reduce maintenance worker exposure to motorized traffic
2. Reduce conflicts with vehicles and roadside appurtenances
3. Minimize fire hazards
4. Improve security at Safety Roadside Rest Areas (SRRAs)
5. Improve traveler stopping opportunities

Objective	Research Project
1, 4, 5	Public/Private Partnership Strategies for SRRAs, 2008
1, 3, 5	Accidents Involving Driver Fatigue, 2007
	Additional research is needed to meet all objectives. Potential research topics previously identified by LA/EC TAP & LAP include: Effectiveness of existing fire control strategies Best practices of fire ladder management

Landscape

Completed and Ongoing
LAP Research Projects

Highway Planting

Goal: Improve planting and revegetation success

Objectives

1.Establish desirable vegetation in the R/W
2. Comply with permit requirements for revegetation and mitigation
3. Develop sustainable landscapes

Objective	Research Project
1, 2, 3	Legume Seed Inoculation for Highway Planting in California, 2006
1, 2	Native Shrub Germination Relative to Compost Type, Application Method and Layer Depth, 2005
1, 2, 3	Competitive Growth Characteristics of Native and Exotic Grasses, 1998
1, 2, 3	Effectiveness of Tap-Root Bags in Establishing Oak, 1995
	Additional research is needed to meet all objectives. Potential research topics previously identified by LA/EC TAP & LAP include: Development of prototype sustainable landscape design

Irrigation

Goal: Conserve water and reduce irrigation life-cycle costs

Objectives

1. Reduce maintenance of irrigation systems
2. Reduce need for supplemental irrigation
3. Improve irrigation efficiency and reliability
4. Reduce irrigation construction costs

Objective	Research Project
2, 4	Providing Adequate Moisture for Plant Establishment under Reduced Irrigation, 2008
	Additional research is needed to meet all objectives. Potential research topics previously identified by LA/EC TAP & LAP include: RICS effectiveness Reclaimed water synthesis study Irrigation management strategies during droughts

Landscape Construction

Goal: Improve landscape construction methods and reduce construction costs

Objectives

1. Improve cost estimating practices
2. Reduce contract change orders
3. Incorporate recycled products
4. Reduce construction worker exposure to traffic
5. Insure timely project completion
6. Increase bidder interest in projects

Objective	Research Project
	Additional research is needed to meet all objectives.